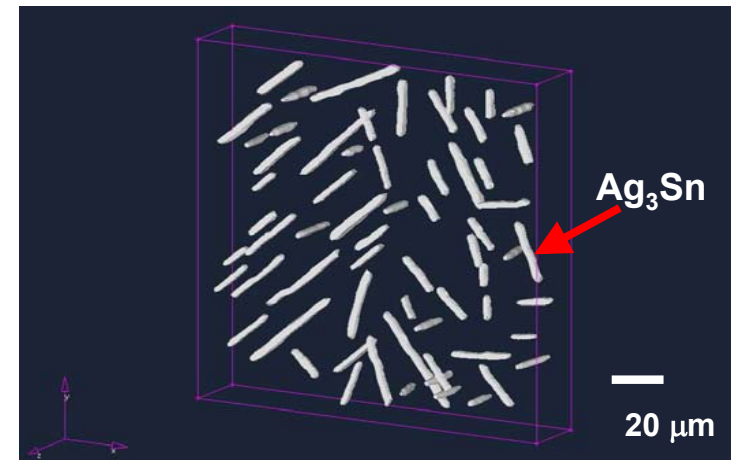


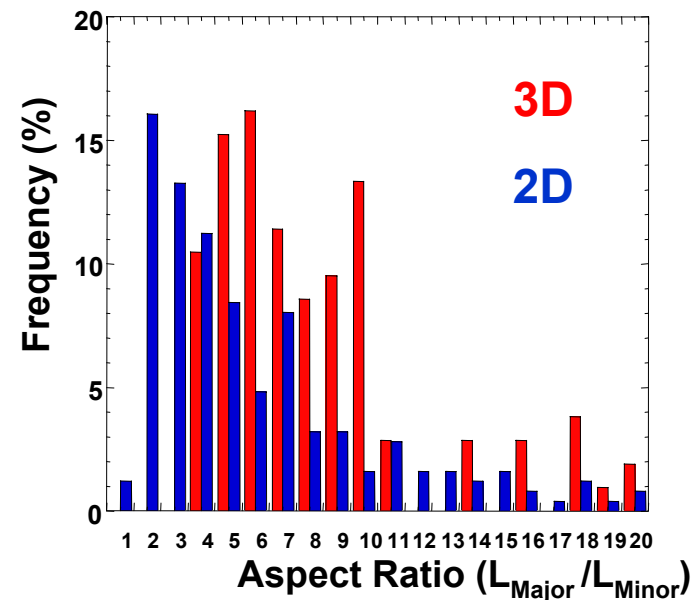
3D microstructure characterization of Pb-free solders by serial sectioning

Rajen Sidhu & Nikhilesh Chawla, Arizona State University, DMR-0092530

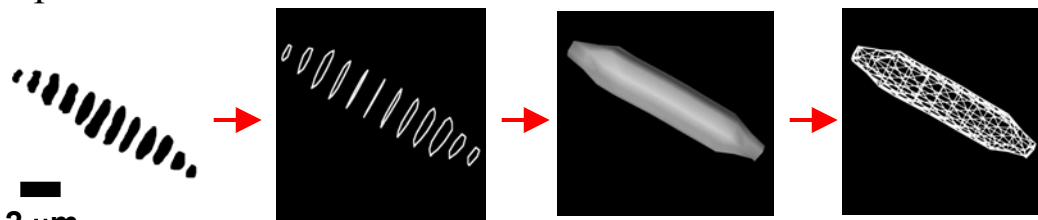
- Microstructure is critical in controlling properties of materials. Traditional metallographic techniques rely on simplifying the three-dimensional (3D) microstructure of a material using two-dimensional (2D) images. This assumption is not always representative of the true microstructural features.
- Serial sectioning coupled with computer-aided reconstruction of 2D microstructural images, was used to visualize the actual solder microstructure (below). Here we present a 3D reconstruction and visualization for a Sn-3.5Ag solder, consisting of needle-like Ag_3Sn intermetallics in a Sn-rich matrix (top right).
- Comparing the aspect ratio measurements from 3D serial sectioning approach and the traditional 2D metallographic technique shows that the 3D approach is more accurate and representative of the true microstructural features.



Reconstructed 3D Sn-3.5Ag solder microstructure



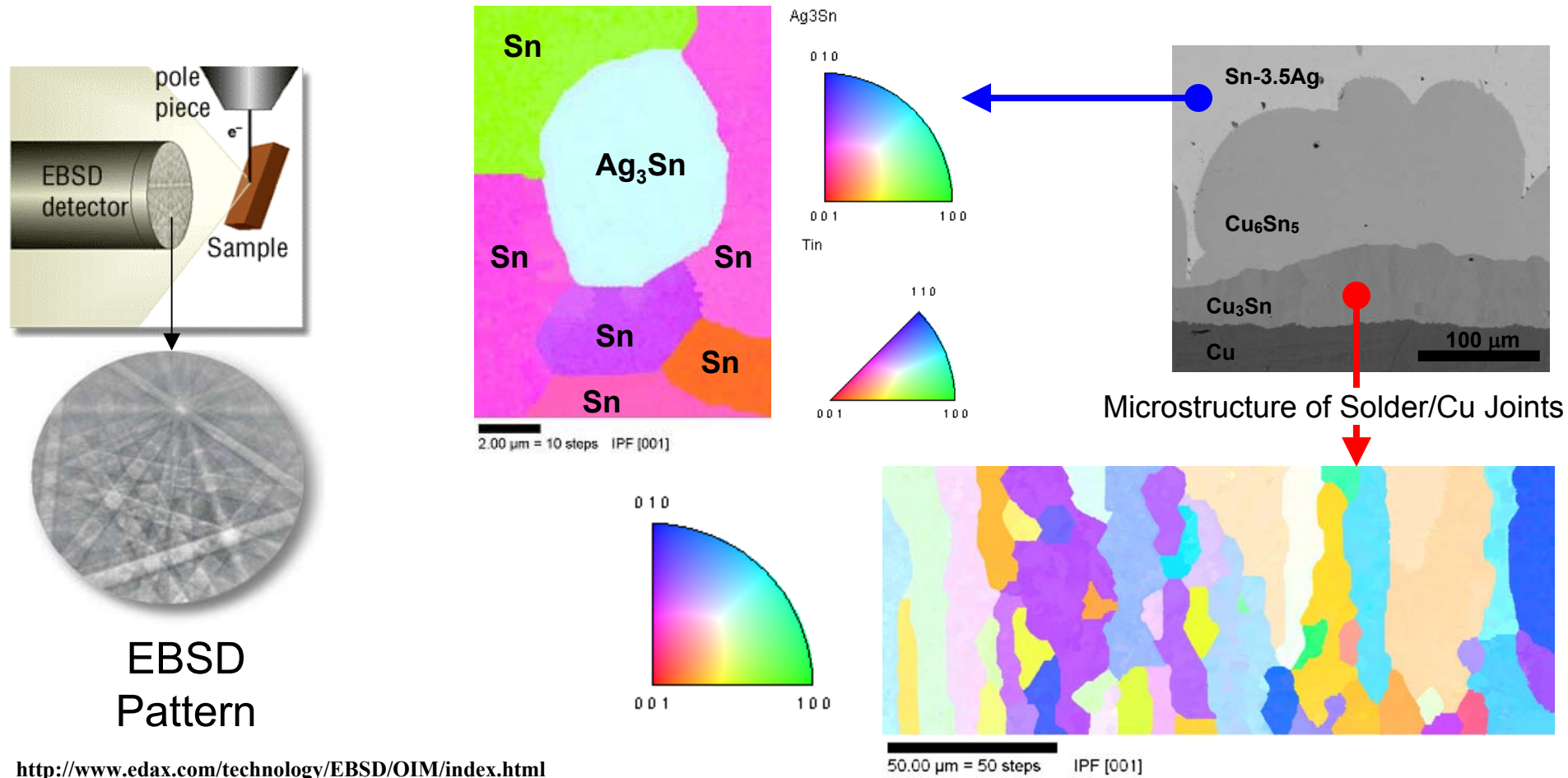
Comparison of the 2D and 3D aspect ratio measurements for Ag_3Sn needles.



3D reconstruction of Ag_3Sn intermetallic via serial sectioning.

Orientation Imaging Microscopy (OIM) Studies on Sn-3.5Ag/Cu Solder Joints

X. Deng and N. Chawla, Arizona State University, DMR # 00925-30



Microstructure of Solder/Cu Joints

The preferred orientation of intermetallics has a critical effect on the mechanical behavior of intermetallics and influences the performance of solder joints. Orientation image microscopy (OIM) uses electron backscatter diffraction (EBSD) to identify the crystal orientation of each grain. It is an ideal technique for texture analysis. For Sn-3.5Ag/Cu solder joints, Ag_3Sn exists inside the Sn matrix, while Cu_6Sn_5 and Cu_3Sn exist at the solder/Cu interface. Both Cu_6Sn_5 and Cu_3Sn show preferred growth orientation during solder reflow or thermal aging.

In this study, OIM analysis was conducted on Cu_6Sn_5 , Cu_3Sn , Ag_3Sn , as well as the Sn matrix. Orientation information of each phase was calculated for each phase.

Development of Joint Packaging Courses between ASU and Intel

N. Chawla, Arizona State University, DMR-0092530

- A comprehensive program in Electronic Packaging involving collaboration between ASU and Intel is being created.
 - This program will be cross- and multi-disciplinary, composed of existing and to-be-developed courses, and to be delivered by both ASU faculty and Intel engineers serving as faculty associates (adjuncts).
 - It is also expected that much (perhaps all) of the coursework will be delivered online.
- Because of the integrated nature of electronics packaging engineering, every graduate program of study will contain courses from electrical engineering, mechanical engineering, materials science and engineering, and possibly mathematics.
 - Students from a broad spectrum of engineering and science backgrounds will be involved.
- Educational objectives and learning outcomes are being outlined with the first course being offered Fall 2004.